



## Should face shield and face mask be used in preventing transmission of COVID-19 in children?

### Authors:

Zaire Nina Tan de Leon, RN, MD [zideleon@up.edu.ph](mailto:zideleon@up.edu.ph)  
Renae Anne Carmela L. Feliciano, RN, MD [rffeliciano@up.edu.ph](mailto:rffeliciano@up.edu.ph)  
Maria Esterlita V. Uy, MD MSPH [herb\\_itb@yahoo.com](mailto:herb_itb@yahoo.com)  
Ben Theodore Cabeluna, RPh, MD [covidrapidreviewteam@gmail.com](mailto:covidrapidreviewteam@gmail.com)  
Leonila Dans, MD, MSc, [Leonila\\_dans@gmail.com](mailto:Leonila_dans@gmail.com)

Date of Review: 30-MAY-2020 (version 3)

Last Updated: 16-JUNE-2020 (version 3)

*This rapid review summarizes the available evidence on the efficacy and safety of using face shield and face mask among children in transmitting COVID-19.*

### KEY FINDINGS

- There is no sufficient evidence to support the effectiveness and safety of face shield and face mask to prevent transmission of COVID-19 in children.
  
- There are no completed or ongoing studies investigating the effectiveness of using face shield and face mask in preventing COVID-19 transmission among infants and children.
- Indirect evidence showed that the use of surgical masks as source control for seasonal coronavirus, influenza, and rhinovirus notably reduced transmission of these viruses. In fact, no human (seasonal) coronavirus virus was detected in respiratory droplets and aerosols among those wearing face masks in one study.
- In one retrospective study, the hazard of semi-rigid hollow objects forming an airtight seal over the nose and the mouth of infants and toddlers aged 4 to 36 months resulted to upper airway obstruction and death by suffocation.<sup>17</sup>
- CDC recommends wearing of face mask in public will help reduce the possibility of spreading the infection of COVID-19 among children 3 years and above. For infants and younger children who are at risk for suffocation and possible respiratory compromise, CDC does not recommend this intervention. WHO recommends that more than using face masks in public places, it will be more prudent to let the children just stay at home to avoid contact with asymptomatic COVID-19 infected adults.

**Disclaimer:** The aim of these rapid reviews is to retrieve, appraise, summarize and update the available evidence on COVID-related health technology. The reviews have not been externally peer-reviewed; they should not replace individual clinical judgement and the sources cited should be checked. The views expressed represent the views of the authors and not necessarily those of their host institutions. The views are not a substitute for professional medical advice.

**Copyright Claims:** This review is an intellectual property of the authors and of the Institute of Clinical Epidemiology, National Institutes of Health-UP Manila and Asia-Pacific Center for Evidence Based Healthcare Inc.

## RESULTS

### Search Result

There are no completed or ongoing studies investigating the effectiveness and safety of using face mask and face shield in preventing COVID-19 infection among infants and children.

The PubMed search yielded 11 articles on the use of face masks among children to reduce transmission of COVID-19 infection during this pandemic. Eight articles were excluded based on the review of titles, as they were found to involve the adult population, disinfection of mask, and not directly to transmission outcomes. On the other hand, 3 full articles (Leung, Cowling, McIntyre) showed indirect evidences of the effectiveness of mask use among children during the seasonal influenza and other infectious outbreaks, but not the COVID-19 infection. Articles (including pre-print) obtained from hand search also showed the use of face mask as an effective intervention in preventing and reducing transmission of COVID-19 among general public.

### INDIRECT EVIDENCES

#### STUDY WITH THE USE OF FACE MASK AMONG CHILDREN DURING SEASONAL INFLUENZA

In a cluster randomized controlled trial conducted by Cowling et al (2009), 407 people (children and adult) with influenza A or B virus (called index patients) and 794 household members (called contact patients) in 259 households were included. These participants were randomized into three groups: control group who received health education on importance of healthy diet and lifestyle, and experimental groups which were the hand washing group and the hand washing plus face mask use group. In this study, 188 index patients were children 15 years or younger. From this index patients ages ≤15 years old, 54 (9%) were secondary cases or household contacts infected with influenza virus. More so, there was a significant reduction in influenza transmission among the experimental group as compared with the control group (14% in hand hygiene group versus 18% in facemask with hand hygiene group versus 24% in the control group). The authors concluded that hand hygiene and the use of facemasks prevent household transmission of influenza virus. These findings suggest that non-pharmaceutical interventions are important in the mitigation of pandemic and inter-pandemic influenza.<sup>10</sup>

#### STUDY WITH THE USE OF FACE MASKS AMONG CHILDREN DURING OTHER INFECTIOUS OUTBREAKS

In a study by Leung et al (2020), 246 participants (age range= 11 to 65 years) who provided exhaled breath samples were included in the study. They were randomized to those not wearing a face mask during the first exhaled breath collection ( $n=122$ ) and to those wearing a face mask ( $n=124$ ). From the participants, 123 had at least one respiratory virus confirmed by reverse transcription PCR (RT-PCR). Among the participants with ages 11-17 years old, eight had influenza viral infection while another 4 had rhinoviral infection. Of these 123 participants, 111 (90%) participants were infected by human (seasonal) coronavirus ( $n=17$ ), influenza virus ( $n=43$ ) or rhinovirus ( $n=54$ ); including 1 participant with coronavirus and influenza virus co-infection and 2 participants with rhinovirus and influenza virus co-infection. Among the 111 participants, coronavirus particles was detected in respiratory droplets (3/10) and aerosols (4/10) from those without face masks. On the other hand, there was no virus detected in the respiratory droplets or aerosols collected from participants wearing face masks. For the influenza virus, 6 of 23 (26%) and 8 of 23 (35%) of the respiratory droplet and aerosol samples, respectively, were detected the virus from the exhaled breath samples of those without face masks; while 1 out of 27 (4%) and 6 out of 27(22%) were detected from those wearing face masks. The results indicated that there was a significant reduction in the detection

of Influenza virus in respiratory droplets by wearing face masks, but there was no significant reduction in viral detection in aerosols. For the rhinovirus, there were no significant differences in the detection of the virus in respiratory droplets (28% among participants not wearing face masks versus 22% among participants wearing face masks) and aerosols (56% among not wearing face masks versus 38% among wearing face masks). The findings indicated that surgical masks could effectively reduce the emission of influenza virus particles into the environment in respiratory droplets, but not in aerosols. The results from this study have important implications for control of COVID-19, suggesting that surgical face masks could be used by ill individuals, including children, to reduce onward transmission.<sup>17</sup>

## STUDY WITH THE USE OF FACE MASKS AMONG ADULTS EXPOSED TO CHILDREN WITH RESPIRATORY ILLNESS

In a prospective cluster randomized trial by MacIntyre et al (2009), 145 households who had been exposed to a child with clinical respiratory illness were recruited as participants of the study. From these, 47 households (94 adults and 180 children) were randomized to the surgical mask group; 46 families (92 adults and 172 children) to the P2 mask (3M flat-fold P2 mask, catalogue no. 9320, Bracknell, Berkshire, UK, has similar specifications as N95 masks used in the United States), for 2 adults, to be worn at all times when in the same room group, and 52 households (104 adults and 192 children) to the no-mask (control) group. Two families in the control group were lost to follow-up. We found that adherence to mask use significantly reduced the risk for influenza-like illness (one-day incubation p-value= 0.015, two-day incubation p-value= 0.046). However, only 21% of household contacts belonging to the face mask group reported wearing the mask often or always during the study period. It was concluded that low adherence to face masks use in a household makes it ineffective for controlling seasonal respiratory disease. However, during times of a pandemic, wearing of face masks might still reduce pandemic transmission in households.<sup>17</sup>

## Recommendations from Other Guidelines

### Local Recommendations

#### PHILIPPINE SOCIETY OF NEWBORN MEDICINE

The Philippine Society of Newborn Medicine (PSNBM) has released a statement regarding the use of face shield for newborn infants during the SARS-COVID-2 pandemic. The society prohibits any form of facial protective covering on the neonates because of the high risk of suffocation or possible occurrence of sudden death infant syndrome. Instead, the PSNBM made the following recommendations for the prevention of COVID-19 among the pediatric population:

- Avoid any unnecessary public contact to limit exposure of children.
- If going out is essential, cover the baby carrier (NOT THE NEWBORN) with a blanket, which helps protect the baby, but still give them the ability to breathe comfortably.
- Keep hands clean before every breastfeeding. Frequent hand washing with soap and water for 20 second
- If hand washing is not possible; hand sanitizer, with at least 60% alcohol as a substitute.
- Clean frequently-touched surfaces such as doorknobs, handles, light switches and electronics.

## DEPARTMENT OF HEALTH

In an administrative order released last April 2020 by the Department of Health, the use of face mask on children was not specified. Rather, it is said that rational use of personal protective equipment should be observed; and medical-grade protective equipment should be reserved for health workers and other front liners, and symptomatic individuals. Other recommendations stated to prevent COVID-19 transmission among all age group are:

- Doing frequent hand washing with soap and water, and discouraging unnecessary touching of eyes, nose and mouth.
- Ensure access to basic hygiene facilities.
- Clean and disinfect the environment regularly.
- Observe physical distancing at all times, and no unnecessary mass gatherings.
- Avoid non-essential travel and activities.

## International Recommendations

### AMERICAN ACADEMY OF PEDIATRICS

The American Academy of Pediatrics (AAP) advocates the use of face masks with smaller and suitable sizes for children ages 3 to 12 years old. Parental supervision is strongly advised as children of this age group are more likely to take off the mask causing frequent touching of the face. It is emphasized that use of face mask alone is not enough to prevent transmission of COVID-19 among children.<sup>3</sup> For infants, social distancing, proper hand washing and avoiding licking things should be additional preventive measures.

### CENTER OF DISEASE CONTROL

Center of Disease Control (CDC) does not recommend the use of cloth face coverings for children under the age of 2, or to anyone who has trouble breathing, unconscious, incapacitated or otherwise unable to remove the face mask without assistance. The following are recommended by The Center of Disease Control on prevention of COVID-19 transmission among children:

- Safety blankets that cover the entire stroller and not just the face should be used.
- If going to the public is unavoidable, physical distancing of a 6 feet distance should be maintained.
- Always keep the hands clean by doing proper hand washing
- Avoid putting unnecessary objects to mouth.
- Disinfect and clean surfaces in household common areas.
- Limit contact with other children and adults with illness or high risk of getting infected.

In this rapid review, there was 1 article included that has recommendations of the use of different kinds of face mask among asymptomatic children during this pandemic for preventing transmission of the disease and its safety.<sup>7</sup>(Table 1.)

## CONCLUSION

Currently, there is still lack of direct evidence on the efficacious use of face masks and face shields among children in preventing COVID-19 infection. However, indirect evidences show that the use of face masks can still protect and prevent COVID-19 infection, as observed in other influenza-like illnesses among older children. Still, when face masks are used by children, these should be appropriately sized and with close parental supervision. Strict adherence to face mask use must be observed. The combination of face mask use with other non-pharmacological intervention like proper hand washing, physical distancing and limiting unnecessary travels has been found to more effectively reduce viral transmission.

There is still insufficient data and case reports to support the safe use of face mask and face shield in preventing transmission of COVID-19 among neonates. Different local and international guidelines from professional societies and government agencies dissuade the use of any face covering among children below 2 years old since this may cause airway obstruction which may eventually lead to suffocation and even sudden deaths among younger children and infants. Further studies should be done to evaluate the safety of face mask and face shield use among neonates.

## Declaration of Conflict of Interest

No conflict of interest

## REFERENCES

1. World Health Organization. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations. *Eur J Pediatric* <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>
2. Centers for Disease Control and Prevention. Coronavirus disease 2019 (COVID-19). Use of cloth face coverings to help slow the spread of COVID-19. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html>
3. American Academy of Pediatrics. Masks and children during COVID-19. <https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/masks-and-children-during-covid-19/>
4. Qiu H, Wu J, Hong L, Luo Y, Song Q, Chen D (2020) Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study. *Lancet Infect Dis*. [https://doi.org/10.1016/S14733099\(20\)30198-6](https://doi.org/10.1016/S14733099(20)30198-6)
5. LuX, ZhangL, DuH, ZhangJ, LiYY, QuJetal(2020)SARS-CoV-2 infection in children. *N Engl J Med*. <https://doi.org/10.1056/NEJMc2005073>
6. Centers for Disease Control and Prevention. Coronavirus disease 2019 (COVID-19). How to protect yourself & others. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>
7. Esposito, Principi et al (May 2020) To mask or not to mask children to overcome COVID-19. *Eur J Pediatr*. 2020 May 9. doi: 10.1007/s00431-020-03674-9
8. Shiu, E. Y. C., Leung, N. H. L. & Cowling, B. J. Controversy around airborne versus droplet transmission of respiratory viruses: implication for infection prevention. *Curr. Opin. Infect. Dis.* 32, 372–379 (2019).
9. Leung, N.H.L., Chu, D.K.W., Shiu, E.Y.C. et al. Respiratory virus shedding in exhaled breath and efficacy of face masks. *Nat Med* 26, 676–680 (2020). <https://doi.org/10.1038/s41591-020-0843-2>
10. Esposito S, Principi N, Leung CC, Migliori GB. Universal use of face masks for success against COVID-19: evidence and implications for prevention policies [published online ahead of print, 2020 Apr 29]. *Eur Respir J*. 2020;2001260. doi:10.1183/13993003.01260-2020.
11. Howard, J.; Huang, A.; Li, Z.; Tufekci, Z.; Zdimal, V.; van der Westhuizen, H.; von Delft, A.; Price, A.; Fridman, L.; Tang, L.; Tang, V.; Watson, G.L.; Bax, C.E.; Shaikh, R.; Questier, F.; Hernandez, D.; Chu, L.F.; Ramirez, C.M.; Rimoin, A.W. Face Masks Against COVID-19: An Evidence Review. *Preprints* 2020, 2020040203 (doi: 10.20944/preprints202004.0203.v1).
12. Cowling BJ, Zhou Y, Ip DK, Leung GM, Aiello AE. Face masks to prevent transmission of influenza virus: a systematic review. *Epidemiol Infect*. 2010;138(4):449-456. doi:10.1017/S0950268809991658

13. Eikenberry SE, Mancuso M, Iboi E, et al. To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. *Infect Dis Model.* 2020;5:293-308. Published 2020 Apr 21. doi:10.1016/j.idm.2020.04.001
14. Sunjaya AP, Jenkins C. Rationale for universal face masks in public against COVID-19 [published online ahead of print, 2020 Apr 30]. *Respirology.* 2020;10.1111/resp.13834. doi:10.1111/resp.13834
15. MacIntyre CR, et al. Face mask use and control of respiratory virus transmission in households. *Emerging Infectious Diseases* 2009 ; 15 : 233–241.
16. Cowling BJ, Chan KH, Fang VJ, et al. Facemasks and hand hygiene to prevent influenza transmission in households: a cluster randomized trial. *Ann Intern Med.* 2009;151(7):437-446. doi:10.7326/0003-4819-151-7-200910060-00142
17. Moon RY; Task force on sudden infant death syndrome. SIDS and Other Sleep-Related Infant Deaths: Evidence Base for 2016 Updated Recommendations for a Safe Infant Sleeping Environment. *Pediatrics.* 2016;138(5):e20162940 doi:10.1542/peds.2016-2940
18. Nakamura SW, Pollack-Nelson C, Chidekel AS. Suction-type suffocation incidents in infants and toddlers. *Pediatrics.* 2003;111(1):e12-e16. doi:10.1542/peds.111.1 e12
19. McDonnell E, Moon RY. Infant deaths and injuries associated with wearable blankets, swaddle wraps, and swaddling. *J Pediatr.* 2014;164(5):1152-1156. doi:10.1016/j.jpeds.2013.12.045
20. Zhou W, Liu W. Hypercapnia and hypocapnia in neonates. *World J Pediatr.* 2008;4(3):192-196. doi:10.1007/s12519-008-0035-5
21. Philippine Society of Newborn Medicine STATEMENT ON THE USE OF FACE SHIELD FOR NEWBORNS DURING THE SARS-COVID-2 PANDEMIC April 20, 2020 <https://pps.org.ph/wp-content/uploads/2020/04/1587474397476979.mp4-1.pdf>
22. American Academy of Pediatrics (AAP). Masks and Children during Covid-19. 9 April 2020 (Retrieved from <https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/masks-and-children-during-covid-19/> 19 April 2020.)
23. Center for Disease Control (CDC). Coronavirus 2019: Pregnancy and Breastfeeding. 13 April 2020. (Retrieved from [https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fprepare%2Fprevention.html](https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fprepare%2Fprevention.html) 19 April 2020)
24. World Health Organization (WHO). Modes of transmission of virus causing COVID-19: Implications for IPC precaution recommendations. Scientific brief. 29 March 2020. (Retrieved from <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations> 19 April 2020)
25. Effectiveness of Surgical and Cotton Masks in Blocking SARS-CoV-2: A Controlled Comparison in 4 Patients Seongman Bae, Min-Chul Kim, Ji Yeun Kim, Hye-Hee Cha, Joon Seo Lim, Jiwon Jung, Min-Jae Kim, Dong Kyu Oh, Mi-Kyung Lee, Seong-Ho Choi, Minki Sung, Sang-Bum Hong, Jin-Won Chung, and Sung-Han Kim, Annals of Internal Medicine 0 0 0

## Appendix1. Characteristics of included studies

No	Title/Author	Study design	Country	Population	Intervention/ Comparator	Outcomes	Key findings
1	Facemasks and hand hygiene to prevent influenza transmission in households  Coyting BJ, Chan KH, Fang VJ, et al (October 2009)	Cluster randomized control trial	Hong Kong	Households (n= 253) with persons (<5 years to >50 years old) infected with influenza A (n= 160) and B (n=99).  Infected individuals as confirmed by rapid testing are called index patient (n= 407) while their household members are called contacts (n= 794)	<b>Intervention:</b> <ul style="list-style-type: none"><li>• Education on proper hand hygiene education to the households</li><li>• Education on proper hand hygiene and proper facemask use as often as possible during the 7 day follow-up period</li></ul> <b>Control:</b> Education about the importance of a healthy diet and lifestyle in illness prevention (for household contacts) and symptom alleviation (for the index case).	<b>Primary outcome:</b> Secondary attack ratio at the individual level (proportion of household contacts infected with influenza virus).  Evaluated through individual acquisition of the disease with RT PCR swab testing for influenza plus at least 2 ILI symptoms: <ol style="list-style-type: none"><li>1. temperature 37.5 °C, cough, headache, sore throat, or myalgia),</li><li>2. symptom onset within 48 hours, and</li><li>3. lived in a household with at least 2 other people, none of whom had reported acute respiratory illness in the preceding 14 days</li></ol> <b>Secondary outcome:</b> secondary attack ratio at the household level (proportion of household acquisition of symptoms of 1 or 2 member)	Reduced transmission of RT-PCR confirmed infection among 154 households who had hand hygiene and wore face masks within 36 hours of symptoms onset [adjusted OR= 0.33 (95% CI: 0.13 to 0.67)].  Use of face mask and hand hygiene, with good adherence and implemented within 36 hours of symptoms onset, seem to reduce acquisition of influenza virus.
2	Respiratory virus shedding in exhaled breath and efficacy of face masks  Leung, N.H.L., Chu, D.K.W., Shiu, E.Y.C. et al (2020)	Randomized control study	Hong Kong	Persons (11 to 265 years, n= 111) who provided exhaled breath and infected with confirmed to be infected with Human (seasonal) coronavirus (n= 17), influenza virus (n= 43) or rhinovirus (n= 54); including a participant with coronavirus and influenza virus co-infection (n=1) and participant with rhinovirus and	<b>Intervention:</b> wearing of face mask  <b>Control:</b> No use of face mask	Laboratory RT-PCR and nasopharyngeal viral confirmed infection as tested by viral shedding (viral copies per sample) and viral detection in nasal swabs, throat swab, respiratory droplet samples and aerosol samples	Coronavirus detection in respiratory and aerosols in 30% and 40% of samples, respectively, without face masks versus no virus detected on participants wearing face masks.  Influenza virus detection in respiratory and aerosols in 26% and 35% of samples, respectively, without face masks versus 4% and 22% on participants wearing face masks.  Rhinovirus virus detection in respiratory and aerosols in 28% and 35% of samples, respectively, without face masks versus 22% and 38% on participants wearing face masks.

				influenza virus co-infection (n=2)			Surgical face masks significantly reduced detection of coronavirus RNA in aerosols ( $p$ -value= 0.04), and influenza RNA in respiratory droplets ( $p$ -value= 0.04).
3	Face Mask Use and Control of Respiratory Virus Transmission in Households  MacIntyre, C. R., Cauchemez, S., Dwyer, D. et al (2009).	Prospective cluster-randomized trial	Sydney, Australia	143 households with 22 healthy adults ≥16 years of age (n= 285) who had been exposed to a child with clinical respiratory illness	<p><b>Intervention:</b></p> <ul style="list-style-type: none"> <li>▪ Wearing of surgical mask of adults at all times when in the same room to the index child</li> <li>▪ Wearing of P2 mask of adults at all times when in the same room to the index child</li> </ul> <p>Masked to mask adult of adults when in the same room to the index child</p>	<p><b>Primary outcome:</b> presence of influenza-like illness or a laboratory diagnosis of respiratory virus infection among the adults within 1 week of enrolment</p> <p><b>Secondary outcome:</b> time from recruitment to infection</p>	Adherent use of surgical mask or P2 masks or surgical masks significantly reduces the risk for influenza-like illness after 1-day and 2-day incubation period [HR= 0.26 (95% CI: 0.09 to 0.77, $p$ -value= 0.015) and HR= 0.32 (95% CI 0.11 to 0.56, $p$ -value= 0.046), respectively]. However, only <50% of participants wore masks most of the time.

**Table 1. Different types of face masks and which could be good or not for children in the community<sup>7</sup>**

Type of mask	Characteristic	Comments for the pediatric population in the community
Cloth Mask	Face mask made of cloth fabric used to cover nose and mouth in the community setting. This is done to reduce the possibility that someone with no symptoms could transmit the disease to others	Homemade or purchased cloth masks are suitable for the average person to wear. For a small child, ensuring the right fit is important. Children younger than age 2 should not wear masks.
Surgical Mask	Loose-fitting, disposable mask that creates a physical barrier between the mouth and the nose of the wearer and potential contaminants in the immediate environment	Availability of smaller size surgical masks for children $\geq 3$ years old
N95 respirator	Personal protective mask that is said to filter at least 95% of airborne particles	Not recommended for the general population including children. Only children who are considered high-risk for severe complications or severely immunocompromised are encouraged to wear an N95 mask to best protect themselves

### Appendix 3. Literature search

DATABASE	SEARCH STRATEGY / SEARCH TERMS	DATE AND TIME OF SEARCH	RESULTS	
			Yield	Eligible
PubMed	Face mask use of children against COVID-19	May 25 2020 11:00 GMT+8	0	0
PubMed	COVID children and face mask	May 25 2020 11:00 GMT+8	11	3

